

CLAIMS

What is claimed is:

1. A method of forming an alloy, comprising:
 - (a) providing a heat source and a nozzle;
 - (b) delivering a feedstock through the nozzle;
 - (c) directing the feedstock through the nozzle to a point where the feedstock converges with the heat source;
 - (d) melting the feedstock with the heat source to form a molten pool on a substrate;
and
 - (e) moving the heat source and the nozzle away from the molten pool, such that the molten pool rapidly cools and solidifies to form a continuous line of deposited alloy to form a part.
2. The method of claim 1, wherein step (a) comprises providing the heat source as a laser that is directed by fiber optics.
3. The method of claim 1, wherein step (a) comprises providing the heat source as an electron beam.
4. The method of claim 1, wherein step (a) comprises providing the heat source as an arc.
5. The method of claim 1, further comprising the step of controlling the heat source with optics and a computer to position the heat source and the nozzle in a desired location for multiple sections and layers of the part being formed.

6. The method of claim 1, wherein step (a) comprises providing four nozzles.
7. The method of claim 6, further comprising the step of orienting the nozzles at 90° increments relative to each other in an array having a selected radius from, and being centered on the heat source.
8. The method of claim 1, wherein step (b) comprises entraining the feedstock in a gas for delivery into and through the nozzle.
9. The method of claim 8, wherein the gas is argon.
10. The method of claim 1, wherein step (e) comprises forming the part with adjacent, side-by-side layers to form a width of the part, and adjacent, stacked layers to form a height of the part.
11. The method of claim 1, wherein step (b) comprises providing the feedstock as a metallic powder.
12. The method of claim 1, wherein step (b) comprises providing the feedstock as a metallic wire.

13. A method of forming an alloy, comprising:
- (a) providing a heat source and a plurality of nozzles;
 - (b) mounting the heat source and the nozzles to a movable platform;
 - (c) delivering a metallic powder through the nozzles;
 - (d) directing the metallic powder through the nozzles to a point where streams of the metallic powder converge with the heat source;
 - (e) melting the metallic powder with the heat source to form a molten pool on a substrate; and
 - (f) moving the platform for the heat source and the nozzles away from the molten pool, such that the molten pool rapidly cools and solidifies to form a continuous line of deposited alloy to form a part.
14. The method of claim 13, wherein step (a) comprises providing the heat source as a laser that is directed by fiber optics.
15. The method of claim 13, wherein step (a) comprises providing the heat source as an electron beam.
16. The method of claim 13, wherein step (a) comprises providing the heat source as an arc.
17. The method of claim 13, further comprising the step of controlling the heat source with optics, the optics also being mounted to the movable platform, and wherein the movable platform is computer-controlled to position the heat source and the nozzles in a desired location for multiple sections and layers of the part being formed.

18. The method of claim 13, further comprising the step of orienting the nozzles at 90° increments relative to each other in an array having a selected radius from, and being centered on the heat source.

19. The method of claim 13, wherein step (c) comprises entraining the metallic powder in an inert gas for delivery into and through the nozzles.

20. The method of claim 13, wherein step (f) comprises forming the part with adjacent, side-by-side layers to form a width of the part, and adjacent, stacked layers to form a height of the part.

21. An alloy, comprising:
aluminum;
lithium;
magnesium;
zirconium; and
scandium.
22. The alloy of claim 21, wherein a weight percentage of lithium is approximately 3% or greater.
23. The alloy of claim 21, wherein a weight percentage of lithium is in a range of approximately 2% to 4%.
24. The alloy of claim 21, wherein a weight percentage of magnesium is approximately 4% or greater.
25. The alloy of claim 21, wherein a weight percentage of magnesium is in a range of approximately 3% to 5%.
26. The alloy of claim 21, wherein a weight percentage of zirconium is approximately 0.5%.
27. The alloy of claim 21, wherein a weight percentage of zirconium is in a range of approximately 0.25% to 1%.

28. The alloy of claim 21, wherein a weight percentage of scandium is approximately 1% or greater.

29. The alloy of claim 21, wherein a weight percentage of scandium is in a range of approximately 0.6% to 1.5%.

30. The alloy of claim 21, wherein the alloy contains the following approximate weight percentages: 3.0% lithium, 4.0% magnesium, 0.5% zirconium, and 1.0% scandium.